

Oral Brush Biopsy Technique Instruction Outcomes for Senior Dental Students

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Abstract: Computerized oral brush biopsy became commercially available in 1999. The objectives of this study were to provide senior dental students with the clinical competency to perform oral brush biopsy and to evaluate the extent to which students used this technique and the outcomes of their biopsy techniques. During the 2004-05 academic year, 114 senior dental students at The Ohio State University College of Dentistry participated in a brush biopsy instructional program. Brush biopsy training was part of their outreach and engagement experience. Technique instruction included 1) completion of thirteen interactive online educational modules, 2) discussion of a written protocol including clinical photographs and an oral pathology position paper, and 3) performance of a trial demonstration brush biopsy on each other. Eighty-one students submitted brush biopsies on clinical patients. Lesions were found in approximately one out of every twenty patients. Seventy-four biopsy results (91 percent) were diagnostic although seventeen (21 percent) were limited by suboptimal cellular representation and seven (9 percent) were inadequate. The high percentage (71 percent) of students who actually applied their training in a true clinical setting indicates that the program was successful in providing dental students the information necessary to perform this procedure on their own. However, the number of incomplete specimens suggests the need for technique refinement and additional clinical experience.

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Key words: oral brush biopsy, dental student technique instruction/competency outcomes

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Oral brush biopsy is a noninvasive method of evaluating oral mucosal lesions for cellular atypia. It is a three-layer transepithelial exfoliative cytology technique. Computerized brush biopsy analysis (Oral CDx®) became commercially available in 1999.¹ Previous authors have discussed the sensitivity,^{2,4} specificity,^{3,4} and overall efficacy^{4,6} of this technique. My research did not identify any studies in the literature that have evaluated the outcomes of brush biopsy training programs. The purpose of this convenience data study was to evaluate an oral brush biopsy technique training program for senior dental students. The objectives of this instructional program were to provide senior dental students with the clinical competency to perform oral brush biopsy and to evaluate the outcomes of their efforts to use this technique on their own.

Methods

During the 2004-05 academic year, 114 senior dental students at The Ohio State University College

of Dentistry participated in a brush biopsy instructional program. Oral brush biopsy training and clinical application were supervised by faculty from the section of primary care and geriatric dentistry. Brush biopsy technique instruction included 1) completion of interactive online educational modules (www.oralcdx.com/store/minimodules.aspx), 2) discussion of a written protocol including sample clinical photographs and an oral pathology position paper, and 3) performance of a trial demonstration brush biopsy on each other. Oral CDx (Suffern, NY, USA) provided trial demonstration and patient clinical kits. The Oral CDx online educational modules included an oral cancer overview, clinical indications for brush biopsy, patient screening recommendations, patient presentation strategies, practice management suggestions, litigation considerations, brush biopsy technique instructions, and guidelines for interpretation of brush biopsy results.

Following completion of their training, all students participated in a two-week extramural outreach and engagement clinical experience. Outreach and engagement provided mobile comprehensive dental

care to thirteen area long-term care facilities and numerous community-based health care centers. During this program, each student performed head and neck examinations including oral soft tissue screening on ten to twenty-five patients. Brush biopsies were performed by students and submitted to Oral CDx for computer evaluation. All biopsies were completed according to the established written protocol (see Figure

1) and Oral CDx guidelines. Students were instructed to brush approximately five to ten times using enough pressure to bend the brush handle and bristles. The clinical sampling endpoint was the appearance of pink microhemorrhage. Samples were immediately spread onto supplied glass slides. Alcohol/wax fixative was liberally applied and allowed to dry for fifteen minutes. Glass slides were then placed in the

All OSU predoc students will receive a Brush Bx Kit and a trial kit at the beginning of their geriatric rotation (geriatric nursing homes, geriatric clinic, Appalachian Dental Program).

All OSU predoc students will complete thirteen interactive education modules at www.oralcdx.com.

All OSU predoc students will complete the brush biopsy clinical and trial procedures including specimen collection, fixation, form submission, evaluation of results, and follow-up (F/U).

Brush Bx's and sample trials will be performed during geriatric rotations under faculty supervision as a required part of the geriatric dental curriculum according to the following protocol:

A. Background (re JADA October 1999 cover article and ADA Seal of Acceptance)

1. 5-10% of all dental patients have white or red "spots" that are often just "watched."
2. 10-15% of these "spots" are found to be atypical by brush biopsy and require scalpel Bx.
3. 3-6% of the atypical results turn out to be cancerous or precancerous.
4. Brush Bx exhibits 96-100% sensitivity (0% false negatives) and 90-97% specificity.

B. Clinical Profile

1. 25% have no risk factors (nonsmokers, nondrinkers, no trauma, etc.), mostly asymptomatic.
2. Potential Brush Bx "spots" should be not deeply or irregularly ulcerated, nonindurated, nonfixed.
3. Brush Bx indications: white and red spots, less than 1 cm, chronic mild ulcerations, atrophic, thickened, traumatized, irritated mucosa. Common sites: #1 Tongue, #2 FOM, #3 RMPad.
4. Brush Bx contraindications: fibromas, mucocles, hemangiomas, pigmented lesions, amalgam tattoos, submucosal masses, and all highly suspicious lesions (immediate scalpel Bx indicated!!).

C. Brush Bx Kit

1. Brush Bx instrument.
2. Pre-coded glass slide and test form.
3. Alcohol/carbowax fixative pouch.
4. Pre-addressed submission container.

D. Brush Bx Procedure (three-layer exfoliative computer-assisted cytology)

1. Open fixative.
2. Wet brush with water or saliva.
3. Use mild (flat ulcerated) to firm (thick keratinized) pressure for 5 (flat)-10 (thick) rotations.
4. See pink micro-bleeding; bend brush handle and bristles.
5. Spread immediately over entire glass slide.
6. Squeeze onto slide entire contents of fixative to saturate specimen.
7. Dry alcohol for 15-20 minutes.
8. Complete submission form.

E. Evaluation of Results

1. Negative: no cellular abnormalities, normal spectral analysis of keratin, normal nuc/cyto ratio; F/U.
2. Positive: atypical epithelial changes indicate scalpel Bx; cancer or dysplasia requires referral.

Figure 1. OSU geriatric dentistry "brush biopsy" protocol

plastic containers provided. Standard brush biopsy computerized test requisition forms were completed and mailed to Oral CDx (see Figure 2).

Brush biopsy results were then reviewed with students and evaluated, applying 95 percent confidence intervals to the numbers of diagnostic versus suboptimal specimens that lacked adequate basal cells. Lesion colors, locations, appearances, symptoms, duration, ulcerations, size, and students' gender were also compared with the occurrence of suboptimal specimens using logistic regression analysis and $p < 0.05$ considered significant. Lesion colors were red, white, and mixed. Lesion locations were combined and grouped as follows: 1) palate and oropharynx, 2) buccal, labial, and alveolar mucosa, 3) ventral, lateral, and dorsal tongue, and 4) floor of mouth and retromolar trigone. Lesion appearances were classified as flat, plaque-like, and verrucous. Lesion symptoms were none, pain, and bleeding. Lesion durations were less than six months, six months to one year, and greater than one year. Ulceration was either present or absent. Lesion sizes were less than five millimeters, five to ten millimeters, ten to twenty millimeters, and more than twenty millimeters. The total number of patients was tabulated and patient ages recorded so that the overall incidence of atypia could be calculated. Patient ages were compared to the incidence of atypia using logistic regression analysis with $p < 0.05$ significant.

Results

Eighty-one of 114 senior dental students performed brush biopsy on clinical patients. Student training sessions, clinical experiences, and brush biopsy submissions were evenly distributed over the four quarters of the senior academic year. Brushable lesions were sampled in approximately one of every twenty patients (5 percent lesion selection rate). Seventy-four Oral CDx results (91 percent) were diagnostic, while seventeen (21 percent) were limited by suboptimal cellular representation and seven (9 percent) were inadequate, requiring repeat testing. The number of suboptimal specimens was statistically significant (95% CI: 12.7-31.5%). Atypia was detected in sixteen of eighty-one (20 percent atypia detection rate) specimens selected from 1,650 total patients (1.5 percent overall incidence rate). The average age of the total patient population was fifty-seven years with a range of fifteen to eighty-five years. The average age of patients providing brush

biopsy specimens was seventy-four years. There was a positive relationship between increasing age and an increased incidence of atypical results ($p = 0.0017$). Lesion colors, locations, appearances, symptoms, duration, ulcerations, size, and students' gender did not affect the occurrence of suboptimal specimens.

Discussion

The high percentage (71 percent) of students who applied their training in a true clinical setting indicates that the program was successful in providing the information necessary to allow students to perform the procedure on their own. This percentage is comparable to clinical technique competency training outcomes discussed by numerous authors.⁷⁻¹⁰

The significant number of suboptimal specimens (21 percent) and inadequate specimens (9 percent) suggests the need for technique refinement and additional clinical experience. In all specimens that were either suboptimal (seventeen) or inadequate (seven), basal cells were not completely represented. The percentage of suboptimal specimens in this study was approximately twice the amount reported in one previous investigation² whose brush biopsies were performed by experienced oral histopathologists.^{11,12} Average insufficient specimen cell counts of 7 percent have been noted in additional studies^{1,3} performed by practiced clinicians. The most likely explanation for these differences is that 30 percent of dental students simply didn't brush hard enough to obtain an optimal complete (three cell layers) sample.¹³

Lesion selection results (5 percent lesion selection rate) were at the low end of the manufacturer's suggested range (5-10 percent). Atypia results (20 percent atypia detection rate and 1.5 percent overall incidence rate) were slightly higher compared to previous publications.¹⁻⁴ Lower lesion selection, higher atypia detection, and higher overall incidence rates could be due to inexperienced observers, variation between observers, stricter determination of brushable lesions, and/or the advanced average age of the patient population.

Conclusions

The results of this study indicate that oral brush biopsy technique training can be successfully integrated into ongoing clinical educational programs for dental students. During training, special emphasis should be placed on brushing hard enough to



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**Oral Brush Biopsy For Computer Assisted Analysis
School Clinic Test Requisition Form**

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Chart #

For School Use

Supervising Faculty	Submitting Student
Name of School	Clinic/Department

Patient Information and Consent

Patient Name: (Last, First, Middle)	Social Security Number:	Date of Birth:	Sex: ☐ Male ☐ Female
Phone: () -	Street Address:	City, State, Zip:	
I authorize the release of any medical or other information necessary to process a claim with my health insurer, and I also authorize release of test results to any specialist selected by the submitting dentist or physician. I authorize payment of any government or other insurance benefits for laboratory analysis to the laboratory. For those who are not a Medicare or Medicaid beneficiary: I accept responsibility for the payment of the laboratory fee if this service is not covered by my health benefits plan.			
Patient Signature			

Laboratory Billing Information

Submit Copies of Medical and Dental Insurance Cards, OR Complete One of the Following

☐ Medicare / Number	☐ Medicaid / Number	
☐ Medical Insurance ID #:	☐ Medical Insurance Group #:	Authorization #:
Responsible Party (Last, First, Middle)	Date of Birth	Patient's Relationship to Insured: ☐ self ☐ spouse ☐ child ☐ other
Medical Insurance Company		
Street Address	City, State, Zip:	
☐ Dental Insurance ID #:	☐ Dental Insurance Group #:	
Responsible Party (Last, First, Middle)	Date of Birth	Patient's Relationship to Insured: ☐ self ☐ spouse ☐ child ☐ other
Dental Insurance Company		
Street Address	City, State, Zip:	
☐ Check included (Checks should be made to the order of CDx™ LABORATORIES) Amount to be Billed: \$65.00 Pricing subject to change.		
Credit Card: ☐ AMEX ☐ Visa ☐ MC ☐ Discover Credit Card #:		
Name as it Appears on Card:		
Cardholder Signature:		Expiration Date
☐ Indigent Patient Without Insurance		

Clinical History and Impression of Oral Lesion - Required Data

Date of Brush Biopsy							
Clinical Impression	Color	Appearance	Ulcerated	Symptoms	Duration of Lesion	Location	R L
☐ Benign ☐ Malignant ☐ Other	☐ White ☐ Red ☐ Mixed	☐ Flat ☐ Plaque-Like ☐ Verrucous	☐ Yes ☐ No	☐ None ☐ Pain ☐ Bleeding	☐ < 6 months ☐ 6 months to 1 year ☐ > 1 year	☐ Floor of Mouth ☐ Buccal Mucosa ☐ Retromolar Trigone ☐ Hard Palate ☐ Oropharynx ☐ Alveolar Mucosa ☐ Ventral Tongue ☐ Lateral Tongue ☐ Dorsal Tongue ☐ Soft Palate ☐ Attached Gingiva ☐ Labial Vestibule	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
Size of Lesion		Current Alcohol Use		Current Tobacco Use			
☐ less than 5mm ☐ 5-10mm ☐ 10-20mm ☐ more than 20mm		☐ less than 8 drinks per week ☐ 8-21 drinks per week ☐ more than 21 drinks per week		# Per Day # Of Years ☐ No use ☐ Cigarettes ☐ Cigars ☐ Pipes ☐ Chewing Tobacco			
Previous Pathology Result of Lesion							

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Figure 2. Oral CDx requisition form

sample three layers of cells. Collaboration with oral pathology specialists might improve results, decrease selection rates, and provide more in-depth detailed knowledge and understanding.

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